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ABSTRACT

Speech samples of 14 normal 2-year-old children and 14 Down's Syndrome 5- to 12-year-old children were analyzed to investigate the structural complexity. Results from the Developmental Sentence Scoring procedure indicated that even when matched with normal children for mean length of utterance, Down's Syndrome Ss produced less syntactically sophisticated utterances. Findings had implications for the delayed or different nature of language development in retarded individuals. (CL)

Developmental Sentence Scoring Applied to Language-learning Normal and Down's Syndrome Children Matched for Mean Length of Utterance

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Developmental sentence scoring applied to language-learning normal and Down's syndrome children matched for mean length of utterance [1]

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The Developmental Sentence Scoring (DSS, Lee, 1974) is a new procedure developed and standardized for assessing the structural complexity of samples of spontaneous speech with children between 2 and 7 years. In DSS, a sample of 50 sentences is selected from the tape-recorded conversation of a child with an examiner and analyzed. A complete sentence is defined as having at least a noun and a verb in subject-verb relationship. The 50 sentences selected for analysis have to be intelligible, consecutive, different, and non-echoed. However, the examiner is allowed to exercise his or her judgement as to which block of 50 consecutive sentences to select from a transcription that contains more than the required number. The criterion is to try to include the child's best performance in the sample selected. Weighted scores are assigned to selected grammatical forms present in the sample. The scores correspond to the order of emergence of those grammatical forms in normal language development according to Lee's reading of current psycholinguistic literature (Lee, 1974). A total DSS score is obtained by adding the sentence scores and dividing by the number of sentences in the sample. The eight grammatical categories included in the DSS are: Indefinite pronoun or noun modifier, Personal pronoun, Main verb, Secondary verb, Negative, Conjunction, Interrogative reversal, and Wh-question. (Figure 1, - Slide 1 -). As shown in Figure 1, there is one additional column on the DSS record sheet. It is labeled "Sentence point." A score of 1 is added there for every sentence which meets all adult standard rules (i.e., not only on the eight categories under consideration in the DSS). As Lee (1974) puts it: "The sentence point is at least a gesture toward acknowledging that there are many more grammatical forms

to be considered than just the eight categories on the DSS" (p. 137).

Data pertaining to the discriminating power, internal consistency, construct validity, temporal reliability, and other stability indexes of the DSS procedure for the total scores and the subscores are available in Koenigsknecht (1974). Lee (1974) recommends 50 sentences as an appropriate sample size on the basis that this seems a reasonable minimal number to expect from most guided conversations between adult and child. However, Johnson and Tomblin (1975) have indicated that a sample size considerably larger than 50 sentences must be collected before DSS reliability may be said to be appropriate and before an interesting reduction in error of measurement can be achieved. Johnson and Tomblin studied children aged 4 and 5 years but they suggested that their data be used as a general guide for other age groups until further research determines the sample size that are appropriate.

The present study sought to use the DSS procedure in analyzing samples of speech obtained from 14 normal and 14 Down's syndrome children in conversation with their mothers, at home, in a free-play situation. The speech data were collected as a part of a more general investigation of mother-child verbal interaction (Rondal, 1976, 1977). Normal and Down's syndrome children were matched for (group) mean length of utterance (MLU), computed in number of morphemes following the criterion given in Brown (1973). Seven Down's syndrome and seven normal children were at each of two MLU levels: 1.75 - 2.25, and 2.50-3.00 (with a few children minimally outside the prescribed MLU range). Normal and Down's syndrome children ranged in chronological age (CA) from 25 to 32 months and from 5 to 12 years, respectively. The families of the normal and Down's syndrome children were matched on the following variables: ethnic group (Caucasian), monolingualism (American-English), structure (husband and wife living at home), maternal and paternal intelligence (within the normal range), socio-economic status (middle-class), and maternal educational level.

In an attempt to meet Johnson and Tomblin's recommendation, the DSS procedure was applied to samples of 75 sentences. The sentences were selected from the corpuses of speech available following Lee's instructions (Lee, 1974), with two exceptions. Imperative sentences and those ready-made sentences (e.g., "See you later", "Thank you", etc.) in which subject deletion is allowed were excluded from the analysis on the ground that they are not representative of the child's grammatical knowledge as translated in speech production. There were two differences between Lee's recommended situation for collecting sentences and the situation used in the present study. First, the child's mother rather than a neutral examiner conversed with the child. Second, Lee (1974) recommends using three types of material to support and stimulate verbal production in the child: toys, pictures, and telling a familiar story. In order to preserve full naturalness in the interaction, this variable was not strictly controlled in the present study. It turned out, however, that the free-play situations and material used by the mothers (play-action games, storybooks, pictures) were comparable from home to home. These two slight departures from Lee's canonical procedure should not be too much of a concern in relating data from the present study to Lee's normative data (Lee, 1974; Koenigsknecht, 1974). Indeed, Koenigsknecht (1974) has reported no difference in the DSS total scores and subscores for two different female examiners, and in DSS total score and five subscores for different stimulus-materials used to stimulate verbal production in the child (higher scores were obtained on Personal pronoun, Secondary verb, and Interrogative reversal in describing pictures; higher scores were obtained on Indefinite pronoun or noun modifier in story-telling activities).

Two grammatical categories of particular interest in the present study were Indefinite and Personal pronouns. Indeed, Morehead and Ingram (1973), and Davis and Seitz (1975) have reported differences between normal and language deviant or language delayed children matched for MLU in rate of development and in frequency of use of pronouns, although for other language measures development was comparable for both groups.

These authors have suggested that pronoun usage may be very sensitive to developmental differences. It is interesting to control whether the same conclusion can be made for a comparison between normal and Down's syndrome children matched for MLU.

Table 1 (Slide 2) displays the data pertaining to means and standard deviations showing comparisons of groups of subjects for MLU, CA, Developmental sentence scores and subscores for normal and Down's syndrome children.

The data were analysed by separate two-way (type of children x MLU level) univariate analyses of variance for non-repeated measures carried on Developmental sentence score and subscores. A summary of the analyses of variance is provided in Table 2 (Slide 3).

For total Developmental sentence score (DSS), an expected main effect of linguistic level (as assessed by MLU) was observed testifying to the sensitivity of the DSS procedure in detecting differences between children at close but different MLU levels. No main effect of type of children (i.e., normal versus Down's syndrome children) was observed for total DSS. However, an influence of type of children on total DSS was apparent as the Type of Children x MLU Level interaction effect reached significance. As shown in Table 1 (Slide 2), this interaction is due to normal children scoring lower on total DSS than Down's syndrome children at MLU level one (MLU range: 1.75 - 2.25) but higher at MLU level two (MLU range: 2.50 - 3.00).

For the Developmental sentence subscores, no interaction effect of MLU Level and Type of Children was observed. An effect of MLU level was observed for Main verb (M.V.), Secondary verb (S.V.), Negative sentence (N.), Conjunction (C.), Interrogative reversal (I.R.), and Sentence point (S.). There was an effect of type of children on Indefinite pronoun or noun modifier (I.P. or N.M.), Main verb (M.V.), Secondary verb (S.V.), Interrogative reversal (I.R.), and Sentence point (S.).

Contrarily to expectations based on previous research with language delayed and language deviant children, no difference was observed between normal and Down's syndrome children in frequency of use or type of personal pronouns.

The suggested framework for interpreting the results is that of the delay-difference question in the language development of mentally retarded children. The delay-difference issue (presented in Yoder and Miller, 1972, and touched upon in Rondal, 1976) centers around the question of knowing whether language development in mentally retarded children is simply delayed - when compared to normal children - and ultimately incomplete, or whether it proceeds in a truly different way from that in normal children. The question has important implications for language training and remediation in retarded children for training and remedial strategies ought to be different according to whether or not language development proceeds in a similar way in retarded and in normal children.

A general and global answer was given to the delay-difference question in Yoder and Miller (1972). These authors suggested that mentally retarded children are roughly similar to younger normal children as far as language development is concerned. Ryan (1975) and Rondal (1976) confirmed Yoder and Miller's conclusion for semantical, semantical-pragmatical, and for some syntactical aspects of speech. However, for certain lexical aspects of speech like diversity of vocabulary of use, both studies found mentally retarded children (Down's syndrome and non-Down's syndrome children) superior to normal children of corresponding levels of linguistic development. The syntactical aspects of speech tapped in Ryan (1975) and in Rondal (1976) had to do with variety of transformations used, inflections, frequency of use of complete sentences versus incomplete ones, and number of modifiers per utterance.

The present investigation focused on other aspects relevant to the syntactical component of speech. The results indicate that things may be more complicated than expected in the comparison of normal and retarded children's syntactical capacities at corresponding MLU levels.

Total Developmental sentence score indicates that syntactical development, at least for those categories analysed by the DSS procedure, is slightly more advanced in Down's syndrome children than in normal children at MLU level 1.75 - 2.25. Howe-

ver, the reverse is true at MLU level 2.50 - 3.00.

When Developmental sentence subscores are considered, Down's syndrome children appear to use more main verbs and more sophisticated types of main verbs than normal children at corresponding MLU levels. This is particularly noticeable for MLU range 1.75 - 2.25. Correspondingly, Down's syndrome children received more sentence points. Indeed, the product-moment correlation coefficient between Main verb and Sentence point categories is .74 (significant at $p<.001$) - see below -. Normal children appear to use more and more advanced types of indefinite pronouns or noun modifiers and more and more advanced types of secondary verbs than Down's syndrome children at corresponding MLU levels. The latter finding applies to MLU range 2.50 -3.00 as not many secondary verbs were used at all by normal and Down's syndrome children between MLU 1.75 and 2.25.

As a rule, normal children made more use of reversal of copula or auxiliary verb <u>be</u> in their interrogative utterances. Down's syndrome children relied more on intonation only to formulate Yes/No questions but their use of Wh-questions was not otherwise different from that of normal children.

Taken together the above data may mean that even when they are matched with normal children for mean length of utterance, Down's syndrome children tend to produce utterances that are slightly less sophisticated from a syntactical point of view. Truly syntactical operations like reversing the order of the first nominal and verbal elements in asking questions and combining main and secondary verbs in the verb phrase seem to be less advanced in retarded children than in normal children even when these children are producing utterances of comparable length.

Of course, the conclusions presented above are suggestive. The number of normal and Down's syndrome children at each MLU level was too small to draw any normative conclusions. However, these suggestions deserve further investigation on the basis of larger samples of subjects. Such and similar work may eventually allow and prompt a more precise tailoring of the language

training and remedial programs to the specific needs of mentally retarded children or of particular categories of mentally retarded children as those needs will appear upon careful examination of language development in the retarded children.

Additionally, Table 3 (Slide 4) supplies a correlation matrix for MLU, CA, total Developmental sentence score and subscores together for normal and Down's syndrome children. Correlations between total Developmental sentence score and subscores were expected on the basis of the statistical information on the DSS procedure provided by Koenigsknecht (1974). Particularly interesting are the correlations between Sentence point and total Developmental sentence score and several Developmental sentence subcategories. They suggest that Sentence point could serve as an acceptable single predictor for several DSS categories.

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Unnumbered footnote

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Footnotes

1. Paper presented at the 101st Annual Meeting of the American Association on Mental Deficiency, New Orleans, Louisiana, June 1977. Author's current address: Dr. J.A. Rondal, Experimental Psychology, University of Liège, 32, Boulevard de la Constitution, B-4000 LIEGE, Belgium.

Table 1

Mean length of utterance, chronological age, total develomental sentence score and subscores for normal and Down's syndrome children.

Children	MLU	CA	DSS	I.P. or N.M.	P.P.	M.V.	S.V.	N.	C.	I.R.	Wh.Q.	S.
N1												
M	1.95	26.6	2.96	46.4	64.3	56.4	2.1	7.7	1.3	14.4	9.7	19.9
SD	.19	1.4	.46	23	26.9	11.4	5.3	4.2	3.1	7.1	4.9	8.1
N2												
M	2.88	29.9	4.79	45.3	83.3	95.7	21.1	21.1	5.7	22.9	25.3	38.9
SD	.18	1.2	.64	19.3	20.4	28.1	10.8	20.1	8.3	15.6	12.1	6.9
DS1												
M	1.94	78.1	3.84	32.9	87	89.4	1.7	18.1	1.3	11.7	14.6	31.6
SD	.17	23.3	.75	15.8	11.4	21.5	4.2	11.8	3.1	7	3	5.1
DS2												
M	2.88	116.6	4.57	33.3	85.4	102.9	13.7	27.4	5.6	11.6	18.9	43.9
SD	.16	19.7	.89	16.2	21.1	26.3	9.4	19.5	9.1	10.5	22.5	9

Note. N: normal children; DS: Down's syndrome children; M: group mean; SD: standard deviation; MLU: mean length of utterance (in morphemes); CA: chronological age (in months); DSS: total developmental sentence score; I.P. or N.M.: indefinite pronoun or noun modifier; P.P.: personal pronoun; M.V.: main verb; S.V.: secondary verb; N.: negative; C.: conjunction; I.R.: interrogative reversal: Wh.Q.: Wh. question; S.: sentence point.

Table 2

Summary of analysis of variance for total developmental score and subscores

Significant effect	DSS	I.P. or N.M.	P.P.	M.V.	S.V.	N.	C.	I.R.	Wh.Q.	S.
MLU[a] level	.01	-	-	.05	.01	.05	.05	.05	-	.01
Type of children[b]	-	.01	-	.01	.01	-	-	.05	-	.01
Type x Level	.05	-	-	-	-	-	-	-	-	-

[a]Mean length of utterance.

[b]Normal versus Down's syndrome children.

Note. DSS: developmental sentence score; I.P. or N.M.: indefinite pronoun or noun modifier; P.P.: personal pronoun; M.V.: main verb; S.V.: secondary verb; N.: negative; C.: conjunction; I.R.: interrogative reversal; Wh.Q.: Wh. question; S.: sentence point.

Table 3

Correlation matrix for mean length of utterance, chronological age, total developmental score and subscores for normal and Down's syndrome children

	MLU	CA	DSS	I.P. or N.M.	P.P.	M.V.	S.V.	N.	C.	I.R.	Wh.Q.	S.
MLU	1.00	.29	.56**	.02	.26	.39*	.35	.23	.34	.18	.36	.64***
CA	.29	1.00	.30	-.26	.30	.41*	-.04	.31	.21	-.28	.03	.53**
DSS	.56**	.30	1.00	.03	.46*	.80***	.68***	.67***	.19	.31	.51**	.83***
I.P. or N.M.	-.02	-.26	.03	1.00	-.26	-.32	.03	-.19	-.02	.20	.02	-.16
P.P.	.26	.30	.46*	-.26	1.00	.35	.04	.09	.03	-.07	.01	.49**
M.V.	.39*	.41*	.80***	-.32	.35	1.00	.51**	.71***	.30	-.06	.13	.74***
S.V.	.35	-.04	.68***	.03	.04	.51**	1.00	.48**	-.09	.33	.40*	.49**
N.	.23	.31	.67***	-.19	.09	.71***	.48**	1.00	.16	-.12	.28	.47*
C.	.34	.21	.19	-.02	.03	.30	-.09	.16	1.00	-.31	-.19	.33
I.R.	.18	-.28	.31	.20	-.07	-.06	.33	-.12	-.31	1.00	.68***	.11
Wh.Q.	.36	.03	.51**	.02	.01	.13	.40*	.28	-.19	.68***	1.00	.29
S.	.64***	.53**	.83***	-.16	.49**	.74***	.49**	.47*	.33	.11	.29	1.00

Note. MLU: mean length of utterance; CA: chronological age; DSS: developmental sentence score; I.P. or N.M.: indefinite pronoun or noun modifier; P.P.: personal pronoun; M.V.: main verb; S.V.: secondary verb; N.: negative; C.: conjunction; I.R.: interrogative reversal; Wh.Q.: Wh. question; S.: sentence point.

*$p < .05$, **$p < .01$, ***$p < .001$ ($df = 26$).

Name:Christ MLU: 1.75 CA: 27 DSS(75): 2.85

Sentences	I.P. or N.M.	P.P.	M.V.	S.V.	N.	C.	I.R.	Wh.Q.	S.	Total
1. Is that mam?	1		1				1			3
2. Is that blue?	1		1				1		1	4
3. That goes in there.	1		2						1	4
4. I do this.	1	1	1						1	4
5. What's that mam?	1		1				1	2	1	6
6. I find piece.		1	-							1
7. I no lost it.	1	1	-		-					2
8. Mam call daddy.			-							0
9. That's the microphone.	1		1						1	3
10. Mam I turn.		1	-							1
11. I find it mam.	1	1	-							2
12. I go potty.		1	-							1
13. It's there.	1		1						1	3
14. That's a awie.	1		1							2
15. What you do over there?		1	-					2		3
16. You look at.		1	1							2
17. I blow hard mam.		1	-							1
18. Puff go outside.			-							0
19. Liza go to bed.			-							0
20. Mam no cry.			-		-					0
21. That's an owl mam.	1		1						1	3
22. Will I have to wash it up?		1	4	5			6		1	17
23. There is a top for this.	1		1						1	3
24. I play with play-doh.		1	-							1
25. I make a house with this.	1	1	-							2

Note. MLU: mean length of utterance, in morphemes; CA: chronological age, in months; DSS (75): total developmental sentence score, i.e. developmental sentence score computed on 75 sentences ; I.P. or N.M.: indefinite pronoun or noun modifier; P.P.: personal pronoun; M.V.: main verb; S.V.: secondary verb; N.: negation; C.: conjunction: I.R.: interrogative reversal; Wh.Q.: Wh. question; S.: sentence point.

Figure caption

Figure 1. Partial DSS chart of Christ, MLU: 1.75, CA: 27 months, a normally developing child.